

Guidance for Waiver from State of Indiana GIS Standard

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Guidance for Waiver from State of Indiana GIS Standard

1. Purpose

Agencies seeking non-standard Geographic Information System (GIS) solutions must demonstrate that the proposed solution is able to leverage existing GIS investments. Guidance for demonstrations of operability within the state's existing GIS environment is provided. This is a dynamic document and will be updated to keep abreast of developments in GIS.

2. Background

ITOC, with the research and testing assistance of the State GIS Task Force, is examining the following question:

Has GIS industry software evolved to the point that the achievement of interoperability allows the State of Indiana to change their GIS software standard?

ITOC, with research and testing assistance of the State GIS Task Force has completed an extensive examination of the current state of GIS technology. We have reached a determination that:

- Progress is being made towards the goal of achieving interoperability between GIS software.
- The [Open GIS Consortium \(OGC\)](#) is the recognized leader for the establishment of professional guidelines pertaining to open standards.
- OGC has certified software modules from several GIS vendors as compliant with open standards.
- OGC has not certified all GIS modules offered from any single vendor.
- OGC is developing a certification process for interoperability between OGC compliant GIS platforms.
- To date OGC has not developed a testing protocol which guarantees interoperability between GIS platforms.
- The interoperability testing and certification process is too resource intensive for the State of Indiana to attempt. State duplication of efforts by OGC to certify interoperability is not cost effective.
- The predominant software currently in use by the GIS community remains the ESRI suite.

ITOC will consider revising the GIS standard when the OGC certifies interoperability between another vendor's complete set of GIS tools and the ESRI products already in use in state government.

We have concluded that at present, there is [no interoperability certification process](#) that justifies abandoning the many functional and economic advantages of the State of Indiana's current GIS standard. However, it is apparent that progress is being made in the area of interoperability between various GIS platforms. That progress warrants continued evaluation to assure that the citizens of

Indiana receive the best value for their dollars. Progress towards interoperable GIS platforms by any one vendor can be evaluated through the [existing waiver process for state standards](#). Waivers will be favorably considered if a non-standard GIS platform is demonstrated to be operable within the state's GIS environment. The following is intended as guidance when applying for waivers from the current state GIS standard.

3. Definition of Operability

Operability is a goal based **upon** the principal of leveraging the state's existing resources. Substantial investments have been **made and continue to be made in the acquisition, maintenance, and access to spatial data. Because the dominant cost of GIS is for the data,** it is not acceptable to duplicate those efforts through implementation of products that cannot take advantage of existing spatial data resources.

Operability is the ability of a given GIS product to fit into the existing state agency GIS infrastructure. **Currently,** operability can be assured through procurement of GIS software from [the ESRI QPA](#). However, it is likely that other vendors can provide interoperable solutions. The viability of those solutions will be evaluated on various points of operability. **The** points of operability to be considered will depend on the functionality class of the proposed solution.

4. Additional Considerations

Licensing of data for use in state government, although not desirable, may be acceptable, in some instances. **The extent of the value added by a reseller of data must be demonstrated before purchase especially when the data being considered uses federal, state or local data as the basis for the product.** Translation, reformatting, reprojection or other conversion of the data for use by the state agency is not an accepted value added service for **the** licensing of data.

Demonstrable higher performance, accuracy, precision or completeness over freely available data is an acceptable added value for licensed data. For example, there are several commercially available roads data sets that include address ranges which **are** more complete **and are** more accurate than freely available US Bureau of Census TIGER data. Licenses of **those** vendors' products, **as illustrated above, whose data provides higher performance over freely available data may be** considered favorably.

Similarly, continued vendor support **after the term of the initial contract** should not be a requirement for keeping a dataset viable for use in state government. To clarify, some vendors require continuing fees to maintain **a dataset**. The option must exist for the state to discontinue the service contract and continue using the data. However, **a** state agency using data under a license may opt to contract for **maintenance** services with a vendor.

Scalability of a solution is the ability of a product or line of products to fulfill **the needs of** more than one class **of functionality with said classes being viewer, desktop, web mapping services and data needs.** Experience has shown **frequently** that when **a product is purchased** to meet needs in one functional class, subsequent purchases for additional functional classes follow. If a vendor offers a solution for only one class of functionality, adherence to the ESRI native data formats is

required. **If** a vendor **sells** a comprehensive line of products that offer a scalable solution, then the requirement for ESRI native data formats may be relaxed. **However**, the ability to import and export to ESRI data formats will be required. The waiver process will be used to address **such** matters of scalability.

5. Demonstrations of Operability

Demonstrations of operability will be done by the agency requesting the waiver and with ITOC evaluating the demonstration. The agency requesting the waiver will implement the proposed solution, providing hardware, network connectivity, data access, and software to set up the solution in the intended environment. Implementation of the demonstration is to be consistent with agency and enterprise policy and standards. ITOC may ask for other agencies to assist as needed.

The demonstration will be considered complete when all state agency representatives involved are satisfied that the demonstration has run its due course. Suitable timeframes will be agreed upon by all

Operability must be demonstrated to ITOC as part of the waiver process. Instances where operability within the state government GIS environment is clearly demonstrated will receive a waiver from ITOC. Waivers under this guidance are valid for one year and must be renewed before implementations can be expanded and **before** either maintenance or support for the non-standard solution can be continued beyond the one year term of the waiver.

At this point in time there are no standard tests to demonstrate operability other than “plug and go,” where the requested solution is installed in an appropriate environment (plugged in) and then put through the paces to demonstrate operability on the various points for the intended class of functionality. This guidance will be updated to reflect experience with demonstrating operability.

6. Points of Operability for Different Classes of GIS Functionality

Procurement of an ESRI product, version 8 (version 4 for ArcIMS) or better, assures operability in each class. Non-ESRI solutions in each class are available and acceptable when points of operability have been demonstrated within the class of functionality for which the solution is sought.

The relationship of the data to the application is important. For **purpose of definition**, **native data** is defined as data that can be directly accessed and used by the application without requiring a change in format that requires **saving** a converted copy of the original data for the duration of use. **Non-native data** is defined as data that can be imported to a native format through a conversion step that requires **saving** a converted copy of the original data for the duration of use.

6.1. Viewer -

6.1.1. Viewer Background

Viewer tasks are repetitive and rely on **the** reuse of reference data to ask questions that are similar but **that** allow **for** changes in one or more variables **in the query**. **An example of a simple viewer would be the use of a statewide county and municipality road map.** In this case, the county of interest could be changed. A more complex example would be **a spatial analysis that locates** which schools are within X miles of Y hospital, where hospital "Y" and the encompassing distance "X" can be varied each time the question is asked. These tasks require minimal understanding of GIS on the part of the user. **The** training required for the user entails familiarizing the user with a minimal number of options to formulate the question.

Reference data may or may not change significantly with time. When the user is able to tolerate **the use of** stale reference data then operability is less of an issue. When the user cannot tolerate stale reference data, then operability is an issue. Operability is most **important when** the user relies on the most current reference data **and the most current reference data are** hosted by another state agency.

6.1.2. Viewer Points of Operability

Output of data is **not necessarily** limited to presenting a result to the user's monitor. **Other uses include** saving results as an image, depicting the result **with** html text from **another source, and capturing** the display for use in **documents produced by other applications such as word processing**. In some instances outputs may be sent directly to a printer or plotter, or be saved in an electronic format like an image file or as an html or text file. There is no requirement to store the result in a native format for reuse in the viewer application.

If data is provided with the viewer then that data must also be accessible by standard GIS software without reformatting or other conversion before use.

Input data **are accessible** as files on the user's PC or elsewhere in the network, from an agency database, or from an ESRI or OpenGIS web mapping service. **It will always be unacceptable** to require the user to manipulate data through reformatting or other conversion before use.

The ability to save queries, maps or projects as files that can be used in web services is desirable. The following formats are strongly recommended - ESRI .axl, ESRI .mxd, extensible mark-up language (XML) or the open Geographic Markup Language (GML).

6.2. Desktop -

6.2.1. Desktop Background

Desktop tasks include those of **the** viewer plus unique **tasks that** do not rely on reuse of data. The user will typically be asking widely varied questions involving data **from multiple sources**, often on behalf of someone else. In some program areas, **desktop** users may be tasked with automation of questions to create viewer type applications. **Desktop** users require substantial understanding of GIS along with substantial subject matter expertise to assure that the results are meaningful. **Their** required training **includes familiarization with** general GIS principles, development of skills in the use of both GIS tools and data, and **includes** substantial expertise in the subject area where GIS is being applied.

Reference data may or may not change significantly with time. When the user is able to tolerate **the use of** stale reference data then operability is less of an issue. When the user cannot tolerate stale reference data, then operability is an issue. Operability is most **important when** the user relies on the most current reference data **and the most current reference data are** hosted by another state agency.

6.2.2. Desktop Points of Operability

Data output includes **the following**: a result sent to the user's monitor, **a saved** result as an image to be plotted, or **a saved** subset of input data in a native format for subsequent use in the desktop application. There **are** substantial needs to store the data in a variety of formats for reuse in the desktop application as native data **and** to import data from, or export data to, non-native formats.

If data is provided with the desktop application then that data must also be accessible by standard GIS software without reformatting or other conversion before use.

Input data may be files accessed through the **following**: files on the user's PC or elsewhere in the network, an agency database, an ESRI or **an** OpenGIS web mapping service. It is **a requirement** that the desktop application allows the user to edit and manipulate data through reformatting, reprojection or other conversion as needed. At a minimum, the desktop application must be able to import data to its native format from non-native formats. **A further requirement is** for the desktop application to be able to directly use data in a number of formats as native data, including standard data. **Also desirable is the ability of** the desktop application **to** be able to convert data in different projections on the fly without requiring extraction, conversion and saving **of** a separate reprojected copy of the original data.

The ability to save queries, maps or projects as files that can be used in **conjunction with** web services is desirable. The following formats are strongly recommended - ESRI .axl, ESRI .mxd, extensible mark-up language (XML) or the open Geographic Markup Language (GML).

The ability to automate desktop tasks may also be desirable. Automated desktop tasks may provide streamlined or extended functionality for other users. Automation can be accomplished through either a scripting application native to the desktop application (such as ESRI's Avenue or AML) or through standard languages like Visual Basic or Java.

6.3. Web Mapping Services -

6.3.1. Web Mapping Background

This GIS capability provides data through web technologies for use in viewer, desktop and professional applications. Two approaches are possible. The first approach is a homogenous, single vendor solution through the use of ESRI products. The second approach is through the adherence to open standards for web GIS which are currently being developed by the Open GIS Consortium (OGC www.opengis.org) for adoption by the American National Standards Institute (ANSI) and the International Standards Organization (ISO).

6.3.2. Web Mapping Points of Operability

Output of web mapping services can be proprietary requiring the user to have the vendor's desktop and professional software in order to publish the data on the web. This is acceptable if the software being used to publish the data is in compliance with the existing GIS standard for state government. Open solutions also exist. Open solutions allow hosting of web services in a standardized manner. In an open solution the user requires software that complies with the open standards instead of requiring a single vendor solution the web host vendor's software to use the data published via the web.

The actual data that is published through either vendor specific or OGC compliant cases of web hosting can be files located on the web host, another network resource, in agency databases, or other web mapping services. The best scenario is for the web hosting of data to be compliant with OGC standards. OGC standards exist for Web Mapping Services (WMS), Web Feature Services (WFS) and are nearing completion for Web Coverage Services (WCS). Finally, it is desirable that the web hosting application be able to convert data from different projections on the fly without requiring extraction, reprojection or conversion and then saving new reprojected copies of the original data before use in the web service.

In any event, if data is provided with the web service then that data must also be accessible by standard GIS software without reformatting or other conversion before use.

Because web services can provide a way to interact with data, the access to the data must be addressed. Access will be defined by the agency requesting the web solution. Access includes requirements for adequate security and assuring that the vendor(s) and end users will obtain the necessary permissions. Procedures to access enterprise GIS data holdings are being developed by the State Agency GIS Task Force.

7. Data Delivered to the State -

7.1. Points of Operability for File Based Data Delivered to the State

Any data delivered to the state either as a stand alone product or included with either a viewer, desktop or web application, must also be accessible by standard GIS software without reformatting or other conversion before use.

- The standard for file based data within state government is primarily the ESRI shapefile.

Other data types may be considered **if** the ESRI suite of tools can treat them as a native format **with the** necessary data elements and functionality **being** preserved for the intended functional class. Commercial off the shelf (COTS) software and custom built applications must be able to use standard data formats without requiring conversion **in order** to become native to the COTS software or custom application.

- Access to file based data within the agency will be determined by the agency requesting the COTS software or custom application.

Access includes **the following**: requirements for adequate security within the agency and across the enterprise, **and** assuring that the vendor(s) and end users will obtain the necessary permissions to use **the** data. Access to enterprise GIS data holdings is in development **by the State Agency GIS Task Force**.

- Content, projections and other relevant standards for framework data set (roads, hydrology, parcels, etc.) are in development by the State Agency GIS Task Force.
- Content, projections and other relevant standards for non-framework data sets are to **be established by** the requesting agency.

7.2. Points of Operability for Relational Databases Delivered to the State

Any data delivered to the state either as a stand alone product or included with either a viewer, desktop or web application, must also be accessible by standard GIS software without reformatting or other conversion before use.

- The standard for relational database geospatial data within state government is set on the middle tier instead of the actual database (i.e. MySQL, Oracle, DB2, SQLserver).

The middle tier used in state government is ESRI's Spatial Database Engine (SDE). Viewer, desktop and web service applications must be able to use ESRI's SDE as a native format. Commercial off the shelf (COTS) software and custom built applications developed for state government must be able to work with data in SDE without conversion to a native format to the COTS software or custom application.

- Access to relational databases within the agency will be defined by the agency requesting the COTS software or custom application.

Access includes requirements for adequate security within the agency and across the enterprise. Access requirements include assuring that the vendor(s) and end users will obtain the necessary permissions to use data needed. [Additional relational database considerations may exist.](#) Procedures to access enterprise GIS data holdings are being developed by the State Agency GIS Task Force.

- Content, projections and other relevant standards for framework data set (roads, hydrology, parcels, etc.) are in development by the State Agency GIS Task Force.
- Content, projections and other relevant standards for non-framework data sets are up to the requesting agency.

7.3. All Data Types Must Include Metadata -

At a minimum, data developed for state government must include all elements of the [Tier Two Indiana GIS Metadata Profile](#). However, fully compliant [Federal Geographic Data Committee \(FGDC\) metadata](#) is preferred. Metadata must be submitted in a format for direct import to an ESRI metadata catalog. Specific data (source, interim, final) that must be accompanied by metadata is **to be established by** the agency requesting that the data be developed.

Table 1. Summary of Points of Operability for Different Classes of GIS Functionality.
(if a point has only “desired” input or output options then at least one must be available)

Functional Class <i>Operability Point</i>	Output	Input
Viewer		
<i>Images</i>	Required (tif, jpg,pdf,etc.)	Not applicable
<i>Text</i>	Required	Not applicable
<i>Files</i>	Not applicable	Required - native, ESRI shapefile Desired - native, OpenGIS
<i>Databases</i>	Not applicable	Required - native, ESRI SDE Desired - native, OpenGIS
<i>Web Services</i>	Desired - native, ESRI AXL, MXD Desired - native, OpenGIS	Desired - native, ESRI (vers 8x, 9x) Desired - native, OpenGIS
Desktop		
	Other considerations exist for application development in the state's enterprise architecture.	
<i>Images</i>	Required (tif, jpg, pdf, etc.)	Not applicable
<i>Text</i>	Not applicable	Not applicable
<i>Files</i>	Required – native, ESRI shapefile Desired - native, OpenGIS	Required - native, ESRI shapefile Desired - native, OpenGIS
<i>Databases</i>	Required – native, ESRI Desired - native, OpenGIS	Required - native, ESRI Desired - native, OpenGIS
<i>Web Services</i>	Desired - native, as ESRI AXL, MXD Desired - native, OpenGIS as GML	Desired - native, ESRI (vers. 8x, 9x) Desired - native, OpenGIS
Web Services		
	Other considerations exist for hosting web services in the state's enterprise architecture.	
<i>Images</i>	Not applicable	Not applicable
<i>Text</i>	Not applicable	Not applicable
<i>Files</i>	Not applicable	Required - native, ESRI shapefile Desired - non-native, OpenGIS
<i>Databases</i>	Not applicable	Required - native, ESRI SDE Desired - native, OpenGIS
<i>Web Services</i>	Not applicable	Desired - native, ESRI (vers. 8x, 9x) Desired - native, OpenGIS
Data		
	Other considerations exist for hosting data in the state's enterprise architecture.	
<i>File Based</i>	ESRI Shapefiles as native format	
<i>Relational Databases</i>	ESRI Spatial Database Engine (SDE) as native format	

Scalable solutions may in some instances allow for a relaxation of the ESRI native data formats and will be addressed on a case by case basis through the waiver process